

REMARKS/ARGUMENTS

**Rejection of Claims 26-27, 29, 31, 33-38, and 40-50 Under
35 U.S.C. §112, second paragraph**

In respond to the rejections of claims 26-27, 29, 31, 33-38, and 40-50, Applicants have amended claims 26, 37, 43 and 47 on the specification originally filed without involving any issue of new matter. Reconsideration of claims 26-27, 29, 31, 33-38, and 40-50 is respectfully requested.

**Rejection of Claims 26, 33-37 and 40-50 Under 35 U.S.C. §
103(a)**

Claims 26, 33-37 and 40-50 are rejected under 35 U.S.C. § 103 (a) as being unpatentable over Applicant's disclosure in combination with Torek (US 6,562,726 or US 6,453,914) .

In the detailed action of the office action, Examiner states that Applicant admitted that the conventional method includes all limitations with the exception of the inert gas. Applicant emphasizes that Applicant never agrees with this opinion in the previous response. Instead Applicant actually stated that this opinion is provided by Examiner and provided several traverse opinions. Applicant actually cited the description of the office action and Applicant uses the description as " In the detailed action of the office action, Examiner states that..." before the opinion to specifically declare that this opinion is provided by Examiner.

In the office action, Examiner states that it is well known in the art to withdraw the wafer slowly from the cleaning solution to improve the cleaning process, by dripping most of the cleaning solution before transferring the wafer to a second cleaning or drying solution. Applicant respectfully traverses this opinion since the claimed invention can provides unexpected result. The conventional method has several drawbacks. For example, after the clean steps are completed, metal corrosion would occur on the sidewalls of the metal lines. There is a large quantity of recesses occurring on the sidewalls of the metal lines, which look like mouse bites. The metal corrosion does not influence the device yield, but reduces reliability of the devices. Moreover, the defect count of the wafer on KLA map is very large, which shields other defects related to the device yield. As a result, the other defects can be not found out at on-line monitoring.

The mechanism of removing polymer residues on the sidewalls of the metal lines with the stripping solution is the stripping solution attacks aluminum or its oxide to remove polymer residues from the sidewalls of the aluminum metal lines, and then dissolving the removed polymer residues in the stripping solution. When there is excess water in the stripping solution Metal corrosion would occur on the sidewalls of the metal lines. FIG. 4 of the claimed invention is a diagram of aluminum etching rate versus water content of the stripping solution when using the stripping solution containing alcohol amine, dihydroxylbenzene, water, hydroxylamine and anticorrosion agent to clean aluminum alloy. As shown in FIG. 4, when water content is below 60 wt.%, aluminum etching rate is smaller than $0.1\text{\AA}/\text{min}$, while water content is up to

98 wt.%, aluminum etching rate is up to 58 Å/min. It is apparent that a little of the stripping solution in a large quantity of water would result in serious metal corrosion on aluminum alloy. Therefore, the stripping solution left on the wafer needs to be completely removed before immersing the wafer in the overflow bath 322 so as to avoid metal corrosion occurring on the sidewalls of the metal lines 102 formed on the wafer.

Accordingly, the claimed invention provides an improved clean method to overcome the drawbacks of the prior art. As to the immersion time, the drip dry time, second immersion time in the claim actually can provide unexpected results and is not inherent in the conventional method disclosed at pages 2 and 3 and in Fig. 3 because the time the wafer is maintained without contacting the stripping solution after being removed from the stripping solution is for dripping down the stripping solution left on the wafer. Generally, a conventional clean method would not specifically remove the stripping solution remained on the wafer taking from the stripping solution before immersing in a large quantity of water in view of production speed and the remaining stripping solution in a large quantity of water would result in serious metal corrosion on sidewall of metal lines such as aluminum alloy lines. Applicant emphasizes that the times as claimed in claim 26 is not inherent in the conventional method since the additional time for placing the wafer over the stripping solution without contacting the stripping solution is to drip down the stripping solution left on the wafer before immersing into water to prevent serious metal corrosion on sidewall of metal lines. For example, the wafer would not be particularly

maintained without contacting the first organic solvent bath after being removed from the first organic solvent bath and before being immersed into the second organic solvent bath in the conventional method in order to increase production capability and to prevent the residual chemical mark. In the conventional method, the wafer is always immediately immersed into the second organic solvent bath after being removed from the first organic solvent bath in less than 10 seconds so that the stripping solution remained on the wafer would be also immersed into the overflow bath to cause serious metal corrosion of metal lines. Thus the times as claimed in claim 26 to drip down the stripping solution left on the wafer can produce unexpected results contrary to the conventional method.

Moreover, Examiner states that one skill in the art would adjust the time to remove the wafer from the stripping solution, and the second cleaning solution, so as to drip most of the stripping solution and organic solution, to obtain optimum results and the time taken for removing the wafer slowly from the cleaning solutions is functionally equivalent to the time taken to place the wafer over the stripping solutions. Applicant respectfully traverses this opinion since functional equivalence is not sufficient to render any claimed invention unpatentable. Moreover, any claimed invention could include elements, steps or processes which can result in functions the same with other previous unveiled citations with different elements, steps or processes. What is claimed are the elements, steps or processes, not the functions or results. Withdrawal of this rejection is respectfully requested.

Claims 26-27, 29, 31, 33-38, and 40-50 are rejected under 35 U.S.C. §103 (a) as being unpatentable over Lee in combination with Terek (US 6,453,914) .

Lee actually discloses a process for removing photoresist residue or other polymeric material from a substrate with a specific cleaning composition. The method of Lee actually discloses a method almost the same with any other conventional method except the specific cleaning composition. Applicant disagrees with Examiner's opinion which states that it would have been obvious for one skilled in the art to adjust the time between removing and immersing the substrate in Lee process to allow stripping solution to drip over the stripping solution and over the solvent and it is well known in the art to withdraw the wafer slowly from the cleaning solutions is functionally equivalent to the time taken to place the wafer over the stripping solutions. Applicant respectfully traverses this opinion since functional equivalence is not sufficient to render any claimed invention unpatentable. Any claimed invention could include elements, steps or processes which can result in functions the same with other previous unveiled citations with different elements, steps or processes. What is claimed are the elements, steps or processes, not the functions or results. Withdrawal of this rejection is respectfully requested.

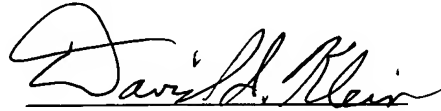
Conclusion

In light of the above remarks to the claims, Applicant contends that claimed invention is patentable thereover. Claims 26-27, 29, 31, 33-38 and 40-50 are now in condition for favorable

consideration and allowance of Claims 26-27, 29, 31, 33-38 and 40-50 are most respectfully requested.

This Amendment was prepared by Applicant, and is being submitted without substantive change by the undersigned Attorney.

Respectfully submitted,

A handwritten signature in cursive script, reading "David I. Klein".

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